CASIO.

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fx-82TL
fx-83WA
fx-85W
fx-85WA
fx-270W PLUS
fx-300W
fx-350TL
fx-911W
User's Guide

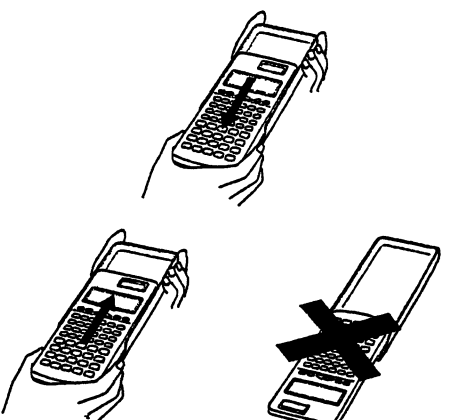
CASIO.

Removing and Replacing the Calculator's Cover

• **To Remove the cover**
Grasp the top of the cover, and slide the unit out from the bottom.

• **To Replace the cover**
Grasp the top of the cover, and slide the unit in from the bottom.

Always slide the unit into the cover with the unit's display end first. Never slide the keyboard end of the unit into the cover.



CE
CASIO ELECTRONICS CO., LTD.
Unit 6, 1000 North Circular Road,
London NW2 7JD, U.K.

Safety Precautions

Be sure to read the following safety precautions before using this calculator. Keep this manual handy for later reference.

⚠ Caution

This symbol is used to indicate information that can result in personal injury or material damage if ignored.

Batteries

- After removing the batteries from the calculator, put them in a safe place where there is no danger of them getting into the hands of small children and accidently swallowed.
- Keep batteries out of the reach of small children. If accidently swallowed, consult with a physician immediately.
- Never charge batteries, try to take batteries apart, or allow batteries to become shorted. Never expose batteries to direct heat or dispose of them by incineration.
- Misuse of batteries can cause them to leak acid that can cause damage to nearby items and creates the possibility of fire and personal injury.
  - Always make sure that a battery's positive ⊕ and negative ⊖ sides are facing correctly when you load it into the calculator.
  - Remove the batteries if you do not plan to use the calculator for a long time.
  - Use only the type of batteries specified for this calculator in this manual.

Disposing of the Calculator

- Never dispose of the calculator by burning it. Doing so can cause certain components to suddenly burst, creating the danger of fire and personal injury.

- The displays and illustrations (such as key markings) shown in this User's Guide are for illustrative purposes only, and may differ somewhat from the actual items they represent.
- The contents of this manual are subject to change without notice.
- In no event shall CASIO Computer Co., Ltd. be liable to anyone for special, collateral, incidental, or consequential damages in connection with or arising out of the purchase or use of these materials. Moreover, CASIO Computer Co., Ltd. shall not be liable for any claim of any kind whatsoever against the use of these materials by any other party.

Handling Precautions

- **Be sure to press the P button on the back of the calculator (step ⑥ on page 29 or 30) before using it for the first time (fx-82TL/fx-83WA/fx-270W PLUS/fx-350TL).**
- **Be sure to press the [ON] key before using the calculator for the first time (fx-85W/fx-85WA/fx-300W/fx-911W).**
- **Even if the calculator is operating normally, replace the battery at least once every three years for the fx-83WA/fx-85W/fx-85WA/fx-270W PLUS/fx-300W/fx-350TL/fx-911W, or at least once every two years for the fx-82TL.**
  Dead battery can leak, causing damage to and malfunction of the calculator. Never leave the dead battery in the calculator.
- **The battery that comes with the calculator when you purchase it is for testing only. It may not provide full service life.**
- **Low battery power can cause memory contents to become corrupted or lost completely. Always keep written records of all important data.**

- **Avoid use and storage in areas subjected to temperature extremes.**
  Very low temperatures can cause slow display response, total failure of the display, and shortening of battery life. Also avoid leaving the calculator in direct sunlight, near a window, near a heater or anywhere else it might become exposed to very high temperatures. Heat can cause discoloration or deformation of the calculator's case, and damage to internal circuitry.
- **Avoid use and storage in areas subjected to large amounts of humidity and dust.**
  Take care never to leave the calculator where it might be splashed by water or exposed to large amounts of humidity or dust. Such elements can damage internal circuitry.
- **Never drop the calculator or otherwise subject it to strong impact.**
- **Never twist or bend the calculator.**
  Avoid carrying the calculator in the pocket of your trousers or other tight-fitting clothing where it might be subjected to twisting or bending.
- **Never try to take the calculator apart.**
- **Never press the keys of the calculator with a ball-point pen or other pointed object.**
- **Use a soft, dry cloth to clean the exterior of the unit.**
  If the calculator becomes very dirty, wipe it off with a cloth moistened in a weak solution of water and a mild neutral household detergent. Wring out all excess moisture before wiping the calculator. Never use thinner, benzine or other volatile agents to clean the calculator. Doing so can remove printed markings and damage the case.

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Two-line Display

You can simultaneously check the calculation formula and its answer.

The first line displays the calculation formula.
The second line displays the answer.

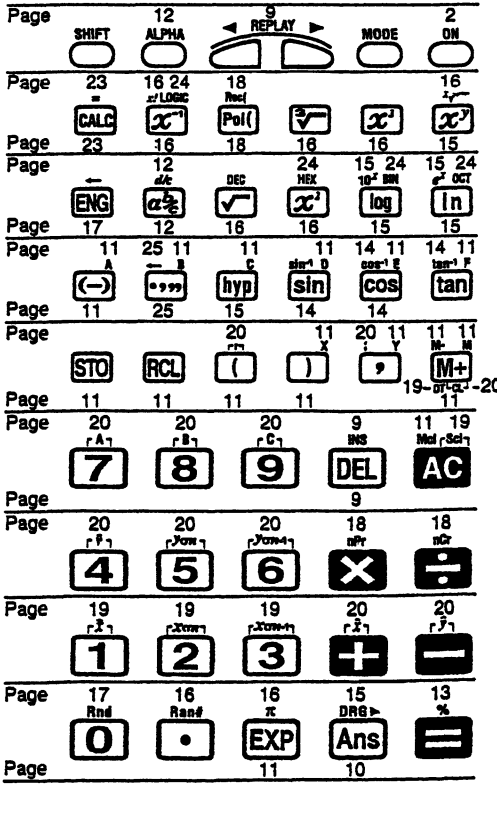
Key Layout

<fx-82TL/fx-83WA/fx-270W PLUS/fx-350TL>

Page		12	9			
	SHIFT	ALPHA	◀ REPLAY ▶		MODE	OFF
Page	16 x!	18 nPr	18 Rec(			16 x√
	x^{-1}	$_nC_r$	Pol(	$\sqrt[3]{\ }$	x^3	x^y
Page	16	18	18	16	16	15
Page		12 d/dx			15 10^x	15 e^x
	← ENG	$a\frac{b}{c}$	$\sqrt{\ }$	x^2	log	ln
Page	17	12	16	16	15	15
Page	11 A	25 11 ← B	11 C	11 sin⁻¹ D	14 11 cos⁻¹ E	14 11 tan⁻¹ F
	(−)	•,,,	hyp	sin	cos	tan
Page	11	25	15	14	14	
Page			20 r∠θ	11 X	20 11 ; Y	11 11 M- M
	STO	RCL	(	)	,	M+
Page	11	11	11	11		19–DT·CL·–20 11
Page	20 ┌A┐	20 ┌B┐	20 ┌C┐	9 INS		11 19 Mcl ┌Sci┐
	7	8	9	DEL		AC/ON
Page				9		
Page	20 ┌∛┐	20 ┌Σx┐	20 ┌Σx²┐			
	4	5	6	×		÷
Page	19 ┌x̄┐	19 ┌Σx┐	19 ┌Σx²┐	20 ┌x̄┐		20 ┌ȳ┐
	1	2	3	+		−
Page	17 Rnd	16 Ran#	16 π	15 DRG▶		13 %
	0	•	EXP	Ans		=
Page			11	10		

fx-85WA/fx-300W/fx-911W:

<fx-85W>


Page
SHIFT
12
ALPHA
9
REPLAY
MODE
2
ON
23
CALC
16 24
x! LOGIC
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12
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HEX
15 24
log
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11 11
M+
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7
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Ran#
16
π
EXP
15
Ans
13
%

</fx-85W>

■ Modes

Application	Mode Name	Mode Indicator
Calculation Modes		
Normal calculations	COMP	–
Standard deviation calculations	SD	SD
Regression calculations	REG	REG
Base-*n* calculations (fx-85W only)	BASE-N	b (binary) o (octal) d (decimal) H (hexadecimal)
Angle Unit Modes		
Degrees	DEG	D
Radians	RAD	R
Grads	GRA	G
Display Modes		
Exponential notation (Canceling FIX and SCI specification)	NORM1 NORM2	– –
Number of decimal place specification	FIX	Fix
Number of significant digit specification	SCI	Sci

Note!

- Mode indicators appear in the lower part of the display, except for the Base-*n* indicators which appear in the exponent part of the display.
- You cannot set the angle unit or the display mode while the calculator is in the BASE-N mode (fx-85W).
- The COMP, SD, and REG modes can be used in combination with the angle unit modes.
- Be sure to check the current calculation mode (SD, REG, COMP) and angle unit mode (DEG, RAD, GRA) before beginning a calculation.

■ Input Capacity

- The memory area used for calculation input can hold 79 "steps." Whenever you input the 73rd step of any calculation, the cursor changes from "_" to "■" to let you know memory is running low. If you still need to input more, you should divide your calculation into two or more parts.

■ Making Corrections During Input

- Use ◀ and ▶ to move the cursor to the location you want.
- Press DEL to delete the number or function at the current cursor position.
- Press SHIFT INS to change to an insert cursor [ ]. Inputting something while the insert cursor is on the display inserts the input at the insert cursor position.
- Press ◀, ▶, SHIFT INS, or = returns to the normal cursor from the insert cursor.

■ Replay Function

- Pressing ▶ or ◀ recalls the last calculation you performed. You can then make any changes you want in the calculation and re-execute it.
- Pressing AC does not clear Replay memory, so you can recall the last calculation even after you press AC.
- Replay memory is cleared whenever you start a new calculation, change to another mode, or turn off power.

■ Error Locator

- Pressing ▶ or ◀ after an error occurs displays the calculation with the cursor positioned at the location where the error occurred.

■ Exponential Display Formats

This calculator can display up to 10 digits. Larger values are automatically displayed using exponential notation. In the case of decimal values, you can select between two formats that determine at what point exponential notation is used. Press [MODE] [MODE] [MODE] [MODE] [3] [1] (or [2]) to select NORM 1 or NORM 2 (fx-85W). For other models, press [MODE] [MODE] [MODE] [3] [1] (or [2]).

• NORM 1

With NORM 1, exponential notation is automatically used for integer values with more than 10 digits and decimal values with more than two decimal places.

• NORM 2

With NORM 2, exponential notation is automatically used for integer values with more than 10 digits and decimal values with more than nine decimal places.

- All of the examples in this manual show calculation results using the NORM 1 format.

■ Answer Memory

- Whenever you press [=] after inputting values or an expression, the calculated result is automatically stored in Answer Memory. You can recall Answer Memory contents by pressing [Ans].
- Answer Memory can store up to 12 digits for the mantissa and two digits for the exponent.
- Answer Memory contents are not changed if the operation performed by any of the above key operations results in an error.

Basic Calculations

- Use the COMP mode for basic calculations.
- **Example 1:** $3\times(5\times10^{-9})$

3 × (5 EXP (−) 9) =

1.5^-08

- **Example 2:** $5\times(9+7)$

5 × (9 + 7) =

80.

- You can skip all) operations before =.

Memory Calculations

■ Independent Memory

- Values can be input directly into memory, added to memory, or subtracted from memory. Independent memory is convenient for calculating cumulative totals.
- Independent memory uses the same memory area as variable M.
- To clear independent memory (M), input 0 STO M.

- **Example:**

23 + 9 = 32	23 + 9 STO M	32.
53 − 6 = 47		
−) 45 × 2 = 90	53 − 6 M+	47.
(Total) −11	45 × 2 SHIFT M−	90.
	RCL M	−11.

■ Variables

- There are nine variables (A through F, M, X and Y), which can be used to store data, constants, results, and other values.
- Use the following operation to delete data assigned to all nine variables: SHIFT CLR =.
- Use the following operation to delete data assigned to a particular variable: 0 STO A. This operation deletes the data assigned to variable A.

- **Example:** 193.2 ÷ 23 = 8.4

  193.2 ÷ 28 = 6.9

193.2 STO (A) ÷ 23 =	8.4
ALPHA (A) ÷ 28 =	6.9

Fraction Calculations

■ Fraction Calculations

- Use the COMP mode for fraction calculations.
- Values are automatically displayed in decimal format whenever the total number of digits of a fractional value (integer + numerator + denominator + separator marks) exceeds 10.

- **Example 1:** $\frac{2}{3} + 1\frac{4}{5}$

2 a⅞ 3 + 1 a⅞ 4 a⅞ 5 =	2⌟7⌟15.

- **Example 2:** $\frac{1}{2} + 1.6$

1 a⅞ 2 + 1.6 =	2.1

- Fraction/decimal calculation results are always decimal.

■ Decimal-to-Fraction Conversion

- **Example:** $2.75 \rightarrow 2\frac{3}{4}$

2.75 =	2.75
a⅞	2⌟3⌟4.
Shift d/c	11⌟4.

■ Fraction-to-Decimal Conversion

- **Example:** $\frac{1}{2} \leftrightarrow 0.5$ (Fraction ↔Decimal)

1 a⅞ 2 =	1⌟2.

a⅔	0.5
a⅔	1⌴2.

Percentage Calculations

- Use the COMP mode for percentage calculations.
- **Example 1:** To calculate 12% of 1500

1500 × 12 SHIFT %	180.

- **Example 2:** To calculate what percentage of 880 is 660

660 ÷ 880 SHIFT %	75.

- **Example 3:** To add 15% onto 2500

2500 × 15 SHIFT % +	2875.

- **Example 4:** To discount 3500 by 25%

3500 × 25 SHIFT % −	2625.

- **Example 5:** If 300 grams are added to a test sample originally weighing 500 grams, what is the percentage increase in weight?

$$\frac{300 + 500}{500} \times 100 = 160\ (\%)$$

300 + 500 SHIFT %	160.

- **Example 6:** If temperature changes from 40°C to 46°C, what percentage did it rise?

$$\frac{46 - 40}{40} \times 100 = 15\ (\%)$$

46 − 40 SHIFT %	15.

Scientific Function Calculations

- Use the COMP mode for scientific function calculations.
- π = 3.14159265359

■ Trigonometric/Inverse Trigonometric Functions

- **Example 1:** sin63°52′41″

fx-85W: [MODE] [MODE] [MODE] [1] → "D"
Other models: [MODE] [MODE] [1]

[sin] 63 [°'"] 52 [°'"] 41 [°'"] [=] → 0.897859012

- **Example 2:** $\cos\left(\frac{\pi}{3}\text{ rad}\right)$

fx-85W: [MODE] [MODE] [MODE] [2] → "R"
Other models: [MODE] [MODE] [2]

[cos] [(] [SHIFT] [π] [÷] 3 [)] [=] → 0.5

- **Example 3:** $\cos^{-1}\frac{\sqrt{2}}{2} = \frac{\pi}{4}$ rad

fx-85W: [MODE] [MODE] [MODE] [2] → "R"
Other models: [MODE] [MODE] [2]

[SHIFT] [cos] [(] [√] 2 [÷] 2 [)] [=] → 0.785398163

[Ans] [÷] [SHIFT] [π] [=] → 0.25

- **Example 4:** $\tan^{-1}0.741$

fx-85W: [MODE] [MODE] [MODE] [1] → "D"
Other models: [MODE] [MODE] [1]

[SHIFT] [tan] 0.741 [=] → 36.53844577

■ Hyperbolic/Inverse Hyperbolic Functions

- **Example 1:** sinh 3.6

  [hyp] [sin] 3.6 [=] → 18.28545536

- **Example 2:** $\sinh^{-1}$ 30

  [hyp] [SHIFT] [sin] 30 [=] → 4.094622224

■ Angle Unit Conversion

- Press [SHIFT] [MODE] to display the following menu.

  D R G
  1 2 3

- Pressing [1], [2], or [3] converts the displayed value to the corresponding angle unit.
- **Example :** To convert 4.25 radians to degrees

  fx-85W: [SHIFT] [MODE] [MODE] [1] → "R"
  Other models: [SHIFT] [MODE] [1]

  4.25 [SHIFT] [MODE] [2] (R) [=] → 4.25r, 243.5070629

■ Common and Natural Logarithms/ Antilogarithms

- **Example 1:** log 1.23 [log] 1.23 [=] → 0.089905111
- **Example 2:** ln 90 ($=\log_e 90$)

  [ln] 90 [=] → 4.49980967
- **Example 3:** e^{10} [SHIFT] [e^x] 10 [=] → 22026.46579
- **Example 4:** $10^{1.5}$ [SHIFT] [10^x] 1.5 [=] → 31.6227766
- **Example 5:** 2^4 2 [x^y] 4 [=] → 16.

■ Square Roots, Cube Roots, Roots, Squares, Cubes, Reciprocals, Factorials, Random Numbers and π

- **Example 1:** $\sqrt{2}+\sqrt{3}\times\sqrt{5}$

  √ 2 + √ 3 × √ 5 = 5.287196909

- **Example 2:** $\sqrt[3]{5}+\sqrt[3]{-27}$

  √ 5 + √ (−) 27 = −1.290024053

- **Example 3:** $\sqrt[7]{123}$ $(=123^{\frac{1}{7}})$

  7 SHIFT √ 123 = 1.988647795

- **Example 4:** $123+30^2$

  123 + 30 x^2 = 1023.

- **Example 5:** 12^3 12 x^3 = 1728.

- **Example 6:** $\dfrac{1}{\frac{1}{3}-\frac{1}{4}}$

  (1 ÷ 3 x^{-1} − 4 x^{-1}) x^{-1} = 12.

- **Example 7:** 8! 8 SHIFT $x!$ = 40320.

- **Example 8:** To generate a random number between 0.000 and 0.999

  SHIFT Ran# = 0.664

  Example (results differ each time)

- **Example 9:** 3π 3 SHIFT π = 9.424777961

■ FIX, SCI, RND

- **Example 1:** $200\div7\times14=400$

  200 ÷ 7 × 14 = 400.

(Specifies three decimal places.)

fx-85W: MODE MODE MODE MODE 1 3
Other models: MODE MODE MODE 1 3

400.000 Fix

(Calculation continues using 10 display digits)

200 ÷ 7 = 28.571

× 14 = 400.000

Performing the same calculation using the specified number of decimal places

200 ÷ 7 = 28.571

(Internal rounding) Shift Rnd 28.571

× 14 = 399.994

- Press MODE MODE MODE MODE 3 1 (fx-85W) to clear FIX specification. For other models, press MODE MODE MODE 3 1.

- **Example 2:** 1 ÷ 3, displaying result with two significant digits (SCI 2)

fx-85W: MODE MODE MODE MODE 2 2
Other models: MODE MODE MODE 2 2

1 ÷ 3 = 3.3^{-01} Sci

- Press MODE MODE MODE MODE 3 1 (fx-85W) to clear SCI specification. For other models, press MODE MODE MODE 3 1.

■ ENG Calculations

- **Example 1:** To convert 56,088 meters to kilometers

56088 = ENG 56.088 03

- **Example 2:** To convert 0.08125 grams to milligrams

0.08125 = ENG 81.25^{-03}

■ Coordinate Conversion (Pol(x, y), Rec (r, θ))

- Calculation results are automatically assigned to variables E and F.
- **Example 1:** To convert polar coordinates (r=2, θ=60°) to rectangular coordinates (x, y) (DEG mode)

x [SHIFT] [Rec] 2 [,] 60 [)] [=] → 1.

y [RCL] [F] → 1.732050808

- [RCL] [E], [RCL] [F] swaps displayed value with value in memory.
- **Example 2:** To convert rectangular coordinates (1, $\sqrt{3}$) to polar coordinates (r, θ) (RAD mode)

r [Pol] 1 [,] [√] 3 [)] [=] → 2.

θ [RCL] [F] → 1.047197551

- [RCL] [E], [RCL] [F] swaps displayed value with value in memory.

■ Permutation

- **Example:** To determine how many different 4-digit values can be produced using the numbers 1 through 7
  - Numbers cannot be duplicated within the same 4-digit value (1234 is allowed, but 1123 is not).

7 [SHIFT] [nPr] 4 [=] → 840.

■ Combination

- **Example:** To determine how many different 4-member groups can be organized in a group of 10 individuals

10 [nCr] 4 [=] → 210.
(fx-85W: [SHIFT] [nCr])

Statistical Calculations

■ Standard Deviation (SD Mode)

- Press MODE MODE 1 (fx-85W) to enter the SD Mode for statistical calculations using standard deviation. For other models, press MODE 2.
  Data input always starts with ON Col = to clear statistical memory.
- Input data is used to calculate values for n, Σx, Σx^2, $\bar{x}$, σ_n and σ_{n-1} which you can recall using the key operations noted nearby.

RCL A	Σx^2
RCL B	Σx
RCL C	n
SHIFT 1	$\bar{x}$
SHIFT 2	σ_n
SHIFT 3	σ_{n-1}

- **Example:** To calculate σ_{n-1}, σ_n, $\bar{x}$, n, Σx, and Σx^2 for the following data : 55, 54, 51, 55, 53, 53, 54, 52

  Enter SD Mode
  fx-85W: MODE MODE 1
  Other models: MODE 2

  SHIFT Scl = (Memory Clear)

  55 DT 54 DT 51 DT 55 DT
  53 DT DT 54 DT 52 DT → 52.

(Sample Standard Deviation σ_{n-1})	SHIFT 3 =	1.407885953
(Population Standard Deviation σ_n)	SHIFT 2 =	1.316956719
(Arithmetic Mean $\bar{x}$)	SHIFT 1 =	58.375
(Number of Data n)	RCL C	8.
(Sum of Values Σx)	RCL B	427.
(Sum of Squares of Values Σx^2)	RCL A	22805.

Data Input Precautions

- [DT] [DT] inputs the same data twice.
- You can also input multiple entries of the same data using [SHIFT] [;]. To input the data 110 ten times, for example, press 110 [SHIFT] [;] 10 [DT].
- The above results can be obtained in any order, and not necessarily that shown above.
- To delete data you have just input, press [SHIFT] [CL].

■ Regression Calculations (REG Mode)

- Press [MODE] [MODE] [2] (fx-85W) to enter the REG mode and then select one of the following regression types. For other models, press [MODE] [3].

  [1]: Linear regression
  [2]: Logarithmic regression
  [3]: Exponential regression
  [▶] [1]: Power regression
  [▶] [2]: Inverse regression
  [▶] [3]: Quadratic regression

- Data input always starts with [SHIFT] [Scl] [=] to clear statistical memory.
- The values produced by a regression calculation depend on the values input, and results can be recalled using the key operations shown in the table below.

[RCL] [A]	Σx^2	[SHIFT] [$x\sigma_{n-1}$]	$x\sigma_{n-1}$
[RCL] [B]	Σx	[SHIFT] [$\bar{y}$]	$\bar{y}$
[RCL] [C]	n	[SHIFT] [$y\sigma_n$]	$y\sigma_n$
[RCL] [D]	Σy^2	[SHIFT] [$y\sigma_{n-1}$]	$y\sigma_{n-1}$
[RCL] [E]	Σy	[SHIFT] [A]	Regression coefficient A
[RCL] [F]	Σxy	[SHIFT] [B]	Regression coefficient B
[RCL] [M]	Σx^3	[SHIFT] [C]	Regression coefficient C
[RCL] [X]	Σx^2y	[SHIFT] [r]	Correlation coefficient r
[RCL] [Y]	Σx^4	[SHIFT] [$\hat{x}$]	$\hat{x}$
[SHIFT] [$\bar{x}$]	$\bar{x}$	[SHIFT] [$\hat{y}$]	$\hat{y}$
[SHIFT] [$x\sigma_n$]	$x\sigma_n$		

• Linear Regression

The regression formula for linear regression is: $y = A + Bx$.

• **Example:** Atmospheric Pressure vs. Temperature

Temperature	Atmospheric Pressure
10°C	1003 hPa
15°C	1005 hPa
20°C	1010 hPa
25°C	1011 hPa
30°C	1014 hPa

Perform linear regression to determine the regression formula terms and correlation coefficient for the data nearby. Next, use the regression formula to estimate atmospheric pressure at 18°C and temperature at 1000 hPa.

Enter REG Mode (Linear Regression)

fx-85W: [MODE] [MODE] [2] [1]
Other models: [MODE] [3] [1]
[SHIFT] [Scl] [=] (Memory Clear)

10 [,] 1003 [DT] 15 [,] 1005 [DT]
20 [,] 1010 [DT] 25 [,] 1011 [DT]
30 [,] 1014 [DT] → 30. (REG)

(Regression Coefficient A) [SHIFT] [A] [=] → 997.4

(Regression Coefficient B) [SHIFT] [B] [=] → 0.56

(Correlation Coefficient *r*) [SHIFT] [r] [=] → 0.982607368

(Atmospheric Pressure at 18°C) 18 [SHIFT] [y] → 1007.48

(Temperature at 1000 hPa) 1000 [SHIFT] [x] → 4.642857143

• Quadratic Regression

- The regression formula for quadratic regression is: $y = A + Bx + Cx^2$.
- Input data using the following key sequence.
  <*x*-data> [,] <*y*-data> [DT]

• **Example:**

xi	yi
29	1.6
50	23.5
74	38.0
103	46.4
118	48.0

Perform quadratic regression to determine the regression formula terms and correlation coefficient for the data nearby. Next, use the regression formula to estimate the values for $\hat{y}$ (estimated value of y) for $xi = 16$ and $\hat{x}$ (estimated value of x) for $yi = 20$.

Enter REG mode (Quadratic regression)

fx-85W: [MODE] [MODE] [2] [▶] [3]

Other models: [MODE] [3] [▶] [3]

[SHIFT] [Scl] [=]

29 [,] 1.6 [DT] 50 [,] 23.5 [DT]

74 [,] 38.0 [DT] 103 [,] 46.4 [DT]

118 [,] 48.0 [DT] → 118. (REG)

(Regression Coefficient A) [SHIFT] [A] [=] → −35.59856934

(Regression Coefficient B) [SHIFT] [B] [=] → 1.495939413

(Regression Coefficient C) [SHIFT] [C] [=] → −6.71629667^{-03}

($\hat{y}$ when $xi = 16$) 16 [SHIFT] [$\hat{y}$] → −13.38291067

($\hat{x}_1$ when $yi = 20$) 20 [SHIFT] [$\hat{x}_1$] → 47.14556728

($\hat{x}_2$ when $yi = 20$) [SHIFT] [$\hat{x}_2$] → 175.5872105

Data Input Precautions

- [DT] [DT] inputs the same data twice.
- You can also input multiple entries of the same data using [SHIFT] [;]. To input the data "20 and 30" five times, for example, press 20 [,] 30 [SHIFT] [;] 5 [DT].
- The above results can be obtained in any order, and not necessarily that shown above.
- To delete data you have just input, press [SHIFT] [CL].

Formula Memory (fx-85W)

- Formula memory lets you input a single formula in memory, and then input values for the formula's variables to calculate results.
- Memory can hold a single formula, up to 79 steps long. This function can be used in the COMP mode only.
- Note that the formula is actually stored in memory when you press the [CALC] key in the sequence below.
- **Example:** To save the following formula, recall it, and then use it to calculate a result: $Y = X^2 + 3X - 12$

  Input the formula.

	[ALPHA] [Y] [ALPHA] [=] [ALPHA] [X] [x^2] [+] 3 [ALPHA] [X] [−] 12	Y=X²+3X−12_ 0.
Store it in memory.	[CALC]	X? 0.
Input a value for its variable.	7 [=]	58.
	[=]	X? 7.
	8 [=]	76.

- Formula memory is cleared whenever you start a new calculation, change to another mode, or turn off power.

Base-*n* Calculations (fx-85W)

- In addition to decimal values, calculations can be performed using binary, octal and hexadecimal values.
- You can specify the default number system to be applied to all input and displayed values, and the number system for individual values you input.
- You cannot use scientific functions in binary, octal, decimal, and hexadecimal calculations. You cannot input values that include decimal part and an exponent.
- If you input a value that includes a decimal part, the unit automatically cuts off the decimal part.
- Negative binary, octal, and hexadecimal values are produced by taking the two's complement.

- You can use the following logical operators between values in Base-*n* calculations: and (logical product), or (logical sum), xor (exclusive logical sum), xnor (exclusive logical sum negation), Not (negation), and Neg (minus).
- The following are the allowable ranges for each of the available number systems.

Binary	$1000000000 \leqq x \leqq 1111111111$
	$0 \leqq x \leqq 0111111111$
Octal	$4000000000 \leqq x \leqq 7777777777$
	$0 \leqq x \leqq 3777777777$
Decimal	$-2147483648 \leqq x \leqq 2147483647$
Hexadecimal	$80000000 \leqq x \leqq$ FFFFFFFF
	$0 \leqq x \leqq$ 7FFFFFFF

- **Example 1:** To perform the following calculation and produce a binary result:

$10111_2 + 11010_2$

Binary mode: [MODE] [2] [BIN] → 0. ᵇ

10111_2 [+] 11010_2 → 0. ᵇ

[=] → 110001. ᵇ

- **Example 2:** To perform the following calculation and produce an octal result:

$7654_8 + 12_{10}$

Octal mode: [MODE] [2] [OCT] → 0. ᵒ

[LOGIC] [LOGIC] [LOGIC] [4] (c) 7054_8 [=]

[LOGIC] [LOGIC] [LOGIC] [1] (d)12_{10} → 0. ᵒ

[=] → 516. ᵒ

- **Example 3:** To perform the following calculation and produce a hexadecimal result:

120_{16} or 1101_2

Hexadecimal mode: [MODE] [2] [HEX] → 0. ᴴ

120_{16} [LOGIC] [2] (or)

[LOGIC] [LOGIC] [LOGIC] [3] (b)1101_2 → 0. ᴴ

[=] → 12d. ᴴ

Degrees, Minutes, Seconds Calculations

- You can perform sexagesimal calculations using degrees (hours), minutes, and seconds, and convert between sexagesimal and decimal values.

- **Example 1:** To convert the decimal value 2.258 to a sexagesimal value

2.258 [=]	2.258
[SHIFT] [,,,]	2°15°28.8

- **Example 2:** To perform the following calculation:

12°34'56" × 3.45

12 [,,,] 34 [,,,] 56 [,,,] [×] 3.45	0.
[=]	43°24°31.2

Technical Information

■ When you have a problem.....

If calculation results are not what you expect or if an error occurs, perform the following steps.

1. [MODE] [1] (COMP mode)
2. fx-85W: [MODE] [MODE] [MODE] [1] (DEG mode)
   Other models: [MODE] [MODE] [1]
3. fx-85W: [MODE] [MODE] [MODE] [MODE] [3] [1] (NORM 1 mode)
   Other models: [MODE] [MODE] [MODE] [3] [1]
4. Check the formula you are working with to confirm it is correct.
5. Enter the correct modes to perform the calculation and try again.

<fx-82TL/fx-83WA/fx-270W PLUS/fx-350TL>

If the above steps do not correct your problem, press the P button (see page 29 or 30) on the back of the calculator to reset it. Pressing the P button deletes all data stored in calculator memory. Make sure you always keep written copies of all important data.

<fx-85W/fx-85WA/fx-300W/fx-911W>

If the above steps do not correct the problem, press the [ON] key. The calculator performs a self-check operation and deletes all data stored in memory if any abnormality is detected. Make sure you always keep written copies of all important data.

■ Error Messages

The calculator is locked up while an error message is on the display. Press [AC] to clear the error, or press [◀] or [▶] to display the calculation and correct the problem. See "Error Locator" on page 9 for details.

Ma ERROR

- **Cause**
  - Calculation result is outside the allowable calculation range.
  - Attempt to perform a function calculation using a value that exceeds the allowable input range.
  - Attempt to perform an illogical operation (division by zero, etc.).
- **Action**
  - Check your input values and make sure they are all within the allowable ranges. Pay special attention to values in any memory areas you are using.

Stk ERROR

- **Cause**
  - Capacity of the numeric stack or operator stack is exceeded.
- **Action**
  - Simplify the calculation. The numeric stack has 10 levels and the operator stack has 24 levels.
  - Divide your calculation into two or more separate parts.

Syn ERROR

- **Cause**
  - Attempt to perform an illegal mathematical operation.
- **Action**
  - Press [◀] or [▶] to display the calculation with the cursor located at the location of the error. Make necessary corrections.

Arg ERROR

- **Cause**
  - Improper use of argument
- **Action**
  - Press ◀ or ▶ to display the location of the cause of the error and make required corrections.

Order of Operations

Calculations are performed in the following order of precedence.

① Coordinate transformation: Pol (x, y), Rec (r, θ)
② Type A functions:
With these functions, the value is entered and then the function key is pressed.
x^2, x^{-1}, $x!$, ° ′ ″
③ Powers and roots: x^y, $\sqrt[x]{\ }$
④ $a^b/_c$
⑤ Abbreviated multiplication format in front of π, memory name, or variable name: 2π, 5A, πA etc.
⑥ Type B functions:
With these functions, the function key is pressed and then the value is entered.
$\sqrt{\ }$, $\sqrt[3]{\ }$, log, ln, e^x, 10^x, sin, cos, tan, $\sin^{-1}$, $\cos^{-1}$, $\tan^{-1}$, sinh, cosh, tanh, $\sinh^{-1}$, $\cosh^{-1}$, $\tanh^{-1}$, (−)
⑦ Abbreviated multiplication format in front of Type B functions: $2\sqrt{3}$, Alog2 etc.
⑧ Permutation and combination: nPr, nCr
⑨ ×, ÷
⑩ +, −

* Operations of the same precedence are performed from right to left. $e^{\ln\sqrt{120}} \rightarrow e^{\{\ln(\sqrt{120})\}}$
Other operations are performed from left to right.
* Operations enclosed in parentheses are performed first.

Stacks

This calculator uses memory areas, called "stacks," to temporarily store values (numeric stack) and commands (command stack) according to their precedence during calculations. The numeric stack has 10 levels and the command stack has 24 levels. A stack error (Stk ERROR) occurs whenever you try to perform a calculation that is so complex that the capacity of a stack is exceeded.

■ Power Supply

The type of battery you should use depends on the model number of your calculator.

<fx-85W/fx-85WA/fx-300W/fx-911W>

The TWO WAY POWER system actually has two power supplies: a solar cell and a G13 Type (LR44) button battery. Normally, calculators equipped with a solar cell alone can operate only when relatively bright light is present. The TWO WAY POWER system, however, lets you continue to use the calculator as long as there is enough light to read the display.

• Replacing the Battery

Either of the following symptoms indicates battery power is low, and that the battery should be replaced.

- Display figures are dim and difficult to read in areas where there is little light available.
- Nothing appears on the display when you press the [ON] key.

• To replace the battery

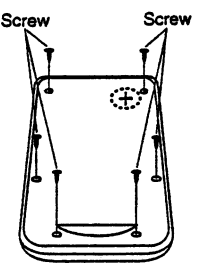
① Remove the six screws that hold the back cover in place and then remove the back cover.

② Remove the old battery.

③ Wipe off the sides of new battery with a dry, soft cloth. Load it into the unit with the positive ⊕ side facing up (so you can see it).

④ Replace the back cover and secure it in place with the six screws.

⑤ Press [ON] to turn power on. Be sure not to skip this step.



<fx-82TL>
This calculator is powered by single AA-size battery.

• Replacing the Battery

Dim figures on the display of the calculator indicate that battery power is low. Continued use of the calculator when the battery is low can result in improper operation. Replace the battery as soon as possible when display figures become dim.

• To replace the battery

① Press [OFF] to turn power off.

② Remove the six screws that hold the back cover in place and then remove the back cover.

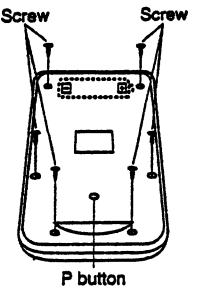
③ Remove the old battery.

④ Load a new battery into the unit so it's positive ⊕ and negative ⊖ sides are facing correctly.

⑤ Replace the back cover and secure it in place with the six screws.

⑥ Use a thin, pointed object to press the P button. Be sure not to skip this step.

⑦ Press [ON] to turn power on.



<fx-83WA/fx-270W PLUS/fx-350TL>
This calculator is powered by single G13 Type (LR44) button battery.

• Replacing the Battery

Dim figures on the display of the calculator indicate that battery power is low. Continued use of the calculator when the battery is low can result in improper operation. Replace the battery as soon as possible when display figures become dim.

• To replace the battery

① Press [OFF] to turn power off.

② Remove the two screws that hold the battery cover in place and then remove the battery cover.

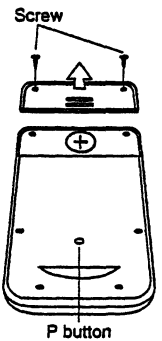
③ Remove the old battery.

④ Wipe off the side of new battery with a dry, soft cloth. Load it into the unit with the positive ⊕ side facing up (so you can see it).

⑤ Replace the battery cover and secure it in place with the two screws.

⑥ Use a thin, pointed object to press the P button. Be sure not to skip this step.

⑦ Press [AC] to turn power on.



• Auto Power Off

Calculator power automatically turns off if you do not perform any operation for about six minutes. When this happens, press [AC] (fx-85W/ fx-85WA / fx-300W/ fx-911W : [ON]) to turn power back on.

■ Input Ranges

Internal digits: 12
Accuracy: As a rule, accuracy is ±1 at the 10th digit.

Functions	Input Range	
$\sin x$	DEG	$0 \leqq \lvert x \rvert \leqq 4.499999999 \times 10^{10}$
	RAD	$0 \leqq \lvert x \rvert \leqq 785398163.3$
	GRA	$0 \leqq \lvert x \rvert \leqq 4.499999999 \times 10^{10}$
$\cos x$	DEG	$0 \leqq \lvert x \rvert \leqq 4.500000008 \times 10^{10}$
	RAD	$0 \leqq \lvert x \rvert \leqq 785398164.9$
	GRA	$0 \leqq \lvert x \rvert \leqq 5.000000009 \times 10^{10}$
$\tan x$	DEG	Same as $\sin x$, except when $\lvert x \rvert = (2n-1) \times 90$.
	RAD	Same as $\sin x$, except when $\lvert x \rvert = (2n-1) \times \pi/2$.
	GRA	Same as $\sin x$, except when $\lvert x \rvert = (2n-1) \times 100$.
$\sin^{-1} x$	$0 \leqq \lvert x \rvert \leqq 1$	
$\cos^{-1} x$		
$\tan^{-1} x$	$0 \leqq \lvert x \rvert \leqq 9.999999999 \times 10^{99}$	
$\sinh x$	$0 \leqq \lvert x \rvert \leqq 230.2585092$	
$\cosh x$		
$\sinh^{-1} x$	$0 \leqq \lvert x \rvert \leqq 4.999999999 \times 10^{99}$	
$\cosh^{-1} x$		
$\tanh x$	$0 \leqq \lvert x \rvert \leqq 9.999999999 \times 10^{-1}$	
$\tanh^{-1} x$		
$\log x / \ln x$	$0 < x$	
10^x	$-9.999999999 \times 10^{99} \leqq x \leqq 99.99999999$	
e^x	$-9.999999999 \times 10^{99} \leqq x \leqq 230.2585092$	
$\sqrt{x}$	$0 \leqq x < 1 \times 10^{100}$	
x^2	$\lvert x \rvert < 1 \times 10^{50}$	
$1/x$	$\lvert x \rvert < 1 \times 10^{100}$; $x \neq 0$	
$\sqrt[3]{x}$	$\lvert x \rvert < 1 \times 10^{100}$	
$x!$	$0 \leqq x \leqq 69$ (x is an integer)	

Functions	Input Range
$_nP_r$	$0 \leqq n \leqq 99$, $r \leqq n$ (n, r is an integer) $1 \leqq \{n!/(n-r)!\} \leqq 9.999999999 \times 10^{99}$
$_nC_r$	$0 \leqq n \leqq 99$, $r \leqq n$ (n, r is an integer)
Pol(x, y)	$\lvert x\rvert$, $\lvert y\rvert \leqq 9.999999999 \times 10^{49}$ $(x^2+y^2) \leqq 9.999999999 \times 10^{99}$
Rec(r, θ)	$0 \leqq r \leqq 9.999999999 \times 10^{99}$ θ: Same as sin$x$, cos$x$
°' "	$\lvert a\rvert$, b, $c < 1 \times 10^{100}$ $0 \leqq b$, c
°' " ⟷	$\lvert x\rvert < 1 \times 10^{100}$ Decimal ↔ Sexagesimal Conversions $0^\circ0'0'' \leqq \lvert x\rvert \leqq 999999^\circ59'0''$
x^y	$x>0$: $-1 \times 10^{100} < y\log x < 100$ $x=0$: $y>0$ $x<0$: $y=n$, $\frac{1}{2n+1}$ (n is an integer) However: $-1 \times 10^{100} < y\log\lvert x\rvert < 100$
$\sqrt[x]{y}$	$y>0$: $x \neq 0$ $-1 \times 10^{100} < 1/x \log y < 100$ $y=0$: $x>0$ $y<0$: $x=2n+1 \frac{1}{n}$ ($n \neq 0$; n is an integer) However: $-1 \times 10^{100} < 1/x \log\lvert y\rvert < 100$
$a^b/_c$	Total of integer, numerator, and denominator must be 10 digits or less (including division marks).
SD (REG)	$\lvert x\rvert < 1 \times 10^{50}$ $\lvert y\rvert < 1 \times 10^{50}$ $\lvert n\rvert < 1 \times 10^{100}$ $x\sigma n$, $y\sigma n$, $\bar{x}$, $\bar{y}$ A, B, r : $n \neq 0$ $x\sigma n-1$, $y\sigma n-1$: $n \neq 0$, 1

* Erros are cumulative with such internal continuous calculations as x^y, $\sqrt[x]{\ }$, $x!$, and $\sqrt[3]{x}$, so accuracy may be adversely affected.

Specifications

Power Supply:

fx-82TL: Single AA-size battery (R6P (SUM-3))

fx-85W/fx-85WA/fx-300W/fx-911W:
Solar cell and a single G13 Type button battery (LR44)

fx-83WA/fx-270W PLUS/fx-350TL:
Single G13 Type button battery (LR44)

Battery Life:

fx-82TL: Approximately 17,000 hours continuous display of flashing cursor.
Approximately 2 years when left with power turned off.

fx-85W/fx-85WA/fx-300W/fx-911W:
Approximately 3 years (1 hour use per day).

fx-83WA/fx-270W PLUS/fx-350TL:
Approximately 12,000 hours continuous display of flashing cursor.
Approximately 3 years when left with power turned off.

Dimensions:

fx-82TL: 19.3(H)×76(W)×164(D) mm
$^{3}/_{4}$"(H)×3"(W)×6$^{7}/_{16}$"(D)

fx-83WA/fx-85W/fx-85WA/fx-270W PLUS/fx-300W/fx-350TL/fx-911W:
10(H)×76(W)×150(D) mm
$^{3}/_{8}$"(H)×3"(W)×5$^{7}/_{8}$"(D)

Weight:

fx-82TL: 115 g (4.1 oz) including battery

fx-85W/fx-85WA/fx-300W/fx-911W:
80 g (2.8 oz) including battery

fx-83WA/fx-270W PLUS/fx-350TL:
90 g (3.2 oz) including battery

Power Consumption: 0.0001W

Operating Temperature: 0°C ~ 40°C (32°F ~ 104°F)

Mode Initialization

The following key operation returns the calculator to its initial mode settings (COMP, Deg, NORM 1)

COMP	Deg	NORM 1
MODE 1	MODE MODE 1	MODE MODE MODE 3 1

Memory Operations

Deleting All Memory Contents (A to F, X, Y, M)

SHIFT Mcl =

123 → A 1 2 3 STO A → A= 123.

AC RCL A → A= 123.

Coordinate Transformation Deg(MODE MODE 1)

·(x, y) → (r, θ) (x = 3, y = 4)

Pol(3 • 4) = → 5. (r=)

RCL F → 53.13010235 (θ=)

STAT

Σx^2	RCL A	Σy^2	RCL D	Σx^3	RCL M
Σx	RCL B	Σy	RCL E	$\Sigma x^2 y$	RCL X
n	RCL C	Σxy	RCL F	Σx^4	RCL Y

Standard Deviation SD(MODE 2)

·Data : 25, 47, 13, 19

SHIFT Scl =

25 DT 47 DT 13 DT 19 DT → 19.

·Mean : SHIFT $\bar{x}$ = → $\bar{x}$ 26.

Regression REG(MODE 3 (REG) 1 (LIN))

·Data : (10, 1003), (15, 1005), (20, 1010), (25, 1011), (30, 1014)

SHIFT Scl =

10 • 1003 DT 15 • 1005 DT 20 • 1010 DT

25 • 1011 DT 30 • 1014 DT → 30.

·Coefficients A and B of regression formula : y = A + Bx

SHIFT A = → A 997.4

SHIFT B = → B 0.56

·Value of y when x = 17

17 SHIFT $\hat{y}$ → $\hat{y}$ 1006.92